



# **SERVICE MANUAL MODUL-LINE BUILT-IN INDUCTION COOKERS**



## **MODEL: IN/MO 7000**

GARLAND COMMERCIAL INDUSTRIES  
185 East South Street  
Freeland, Pennsylvania 18224  
Phone: (570) 636-1000  
Fax: (570) 636-3903

GARLAND COMMERCIAL RANGES, LTD.  
1177 Kamato Road, Mississauga, Ontario L4W 1X4  
CANADA  
Phone: 905-624-0260  
Fax: 905-624-5669

Enodis UK LTD.  
5E Langley Business Centre  
Station Road, Langley SL3 8DS Great Britain  
Phone: 01753 485900  
Fax: 01753 485901



# TABLE OF CONTENTS

<b>SECTION 1 – REQUIREMENTS</b>	<b>4</b>
Authorized Personnel	4
"Operation Instructions" Knowledge	4
Knowledge Of Electronic Systems	4
<b>SECTION 2 – SYSTEM DESCRIPTION</b>	<b>5</b>
Block Schematic	5
Voltage Supply	6
Power Board	6
Control unit	6
Display	6
Error Messages	7
<b>SECTION 3 – INITIAL OPERATION</b>	<b>8</b>
Function control	8
Display	8
Pan Detection	8
Power	8
Fan	8
<b>SECTION 4 – TROUBLE SHOOTING AND REPAIRS</b>	<b>9</b>
Trouble Shooting	9
Error-Code	9
Additional Errors	11
Repair Of Problems	12
Adjustments	14
Generator Type	14
Pan detection	14
Power	14
Repair by Garland	14
<b>SECTION 5 – APPENDIX</b>	<b>15</b>
Internal Connections	15
Rectifier Circuit Board C014	15
CPU-Circuit Board C018	16
Power Circuit Board C026	17
Transformer	18
Rectifier And Transistor Module	18

# SECTION 1 – REQUIREMENTS

## Authorized Personnel

The operator has to insure that all installation, maintenance and inspection work is carried out by authorized and qualified personnel who has done a training course at Inducs Ltd.

## “Operation Instructions” Knowledge

In order to do service work on an induction generator, the operator must have an extended knowledge of the “Operating Instructions”.

## Knowledge Of Electronic Systems

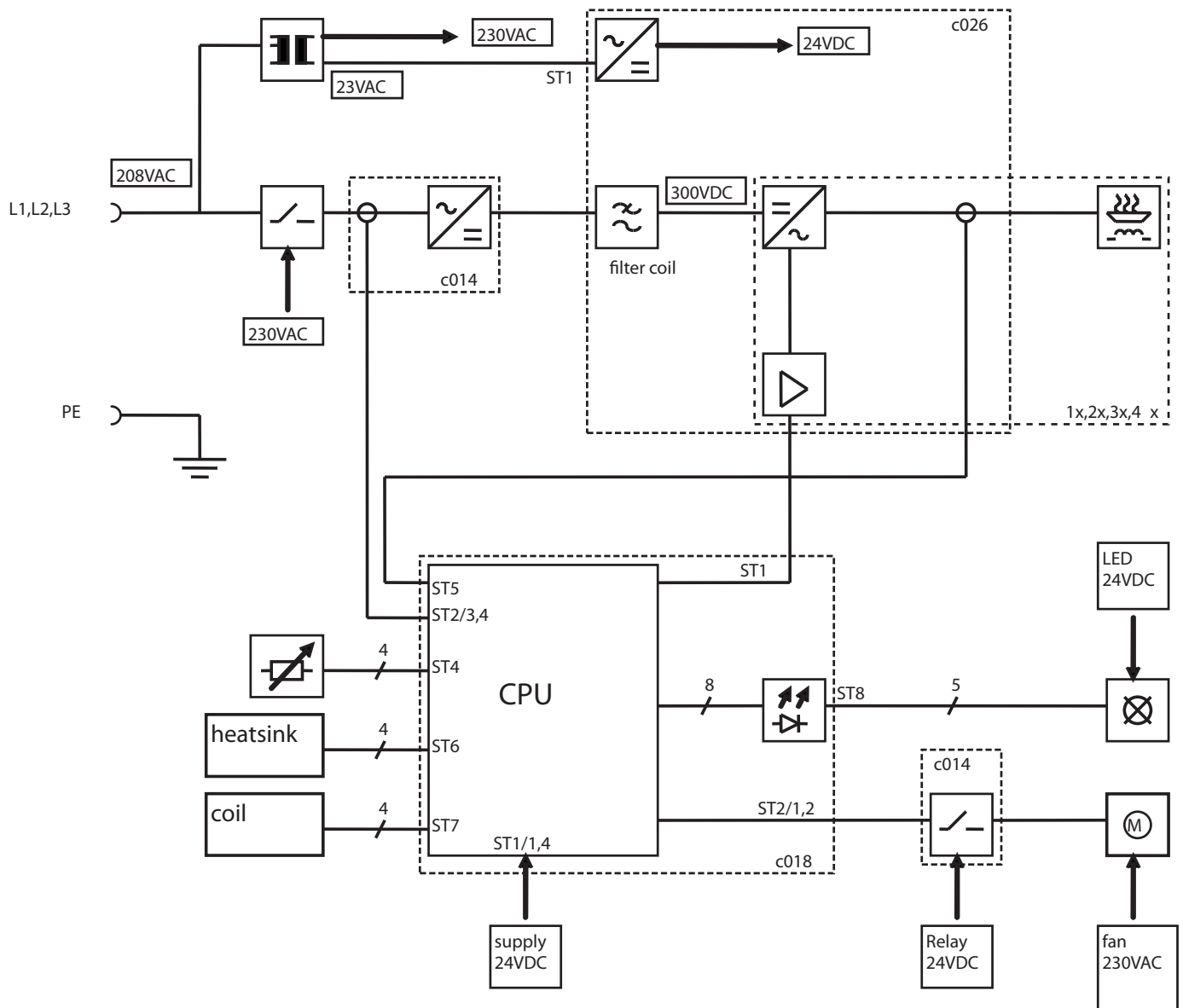
The service- and maintenance operator must have knowledge of the following components :

- Diodes
- Z-Diodes (Zener-Diodes)
- Rectifiers (2phases and 3phases)
- Power transistor (IGBT)

The operator must know how to measure the electric potential, current and resistors by means of a digital multimeter. He also has to know how to check diodes with a diodes tester.

## SECTION 2 – SYSTEM DESCRIPTION

### Block Schematic



## Voltage Supply

The power board voltage supply is wired with the power contactor. On starting the generator, voltage is supplied to the power board. The transformer is connected directly at the entrance of the power supply. The transformer supplies two different voltages: 230VAC for the power contactor and the fan as well as 23VAC for the low voltage supply. The 23VAC are changed on the circuit board C026 to 24VDC.

The following components are supplied with 24VDC:

- CPU-circuit board (C018)
- IGBT (C026)
- Fan relay (C014)
- External lamps

## Power Board

As already stated, the power board is supplied by the power contactor. The mains current is measured by a current transformer, directly at the entrance of the 3-phases-rectifier, After the rectifier there is a direct voltage of 300V. The inductance that follows filters high frequency (EU) current .

At the following power switch (IGBT) an alternating current of approximately 20kHz is generated. This alternating current (coil current) is transferred to the induction coil. At the exit of the circuit board (C026), the coil current is measured by a current transformer.

## Control unit

The control unit is the heart of the generator. This is the CPU-circuit board (C018) with an integrated microprocessor which manages the whole control system.

The following data are measured:

- Coil current
- Phases current
- Performance rate (Poti)
- Heat sink temperature (IGBT)

- Coil temperature
- Ambient temperature

The power switch (IGBT), the fan as well as the display are managed in response to these factors.

## Display

Two elements are used for this display:

1. LED-group (LED1 - LED8) on the CPU-Circuit board (C018)
2. External lamps (24V), maximum 5 pieces

The five external lamps are connected with the five LED's (LED1-LED5). Please distinguish between operation lamps and error lamps. The operation lamp shows what kind of operation for the respective field:

- Lamp out:      Field is cut out
- Lamp flashes briefly      Pan detection (pan is searched)
- Lamp flashes an error code:      Error message (see Error Messages table)
- Lamp continuously on:      Power on

The error lamp indicates an error function.

LED1 to LED4 lead to external lamps on the outside, they are used as operational lamps or as error lamps, depending on the generator type. If an operation lamp or an error lamp is shared by two fields (for example the surface covering this induction type) the display can be overwritten from another field. As far as the error code display is concerned, the lower field has priority.

LED5 lead to the outside for an external lamp also. This is the general error lamp for all fields all the time.

In an error, LED6 to LED8 show the error code, but only until error code 7. If this happens in some errors, the lower field and the lower error code have priority.

## Error Messages

LED 8	LED 7	LED 6	Code	Signification	NOTE
—	—	—	—	No error, normal function	
—	—	On	01	No coil current, overdrive caused by non induction pan	
—	On	—	02	High coil current, overdrive by non induction pan	
—	On	On	03	Temperature heat sink too high	
On	—	—	04	Temperature heating area (coil) too high	1
On	—	On	05	Potentiometer defected , wiring disconnected	
On	On	—	06	Temperature inside the unit too high	
On	On	On	07	Heating area – coil sensor short circuit	2
—	—	—	08		
—	—	—	09		
—	—	—	10	Communication error (serial interface)	
—	—	—	11		
—	—	—	12		
—	—	—	13		
—	—	—	14		
—	—	—	15		

1. The induction unit can only be started again if the fault has been acknowledged (turn power rotary knob "off")
2. The induction unit continues working but the temperature of the cooking platform is not controlled anymore.

## SECTION 3 – INITIAL OPERATION

### Function control

To check the function controls, the induction generator must be totally connected.

### Display

1. The external lamps must be checked.
2. The operation lamp flashes if a coil is not used (Searching function).
3. This procedure must be repeated for every coil.

### Pan Detection

To check the pan detection, two pans are needed: one with a diameter of 8cm (3") and the other with a diameter of 12cm (4.75"). Only the pan with a diameter of 12cm (4.75") should be detected. A coil should not start operation when it is not being used.

This procedure must be repeated for every coil.

### Power

Place an "induction ready" pan with a diameter of 22-24cm (8.5"-9.5") onto the coil. Measure the generator power at maximum level. This should be at the nominal power (tolerance +/- 10%). This procedure must be repeated for every coil.

### Fan

Place various pans on the coils and start the generator on the highest level. After a few minutes the fan should start. The fan is controlled by the temperature and starts when the heat sink temperature is about 50°C/122°F.



## SECTION 4 – TROUBLE SHOOTING AND REPAIRS

This section includes a list of the main errors, their causes and the respective steps to correct.

### Trouble Shooting

#### Error-Code

		Problem	Possible Cause		Measure		
Code	No.		No		No		W
No	Normal operation						
1	S01	No coil current Hardware overcurrent	U10	Non induction type pan	M10	Compare on another cooking platform and with an induction type pan	E
			U11	Coil defective	M11	Check coil	L
			U12	Power circuit board defective	M12	Replace power circuit board	L
2	S02	High coil current Software overcurrent	U10	Non induction type pan	M10	Compare on another cooking platform and with an induction type pan	E
			U12	Power circuit board defective	M12	Replace power circuit board	L
			U13	Error on DIP-Switch-adjustment on CPU	M13	Check DIP-Switch adjustment	L
			U14	CPU-circuit board defective	M14	Replace CPU-circuit board	L
3	S03	Temperature heat sink	U30	Air entrance/exit obstructed	M30	Clear air transport	E/L
			U31	Dirty fan/heat sink	M31	Clean fan	L
			U32	Fan defective	M32	Check fan	L
			U33	Rectifier circuite board defective	M33	Replace rectifier circuit board	L
			U34	Sensor Heat sink defective	M34	Check sensor and heat sink	L
			U14	CPU-circuit board defective	M14	Replace CPU-circuit board	L
4	S04	Temperature cooking platform	U40	Empty cooking	M40	Empty pan	E
			U41	Interruption of coil sensor	M41	Check coil sensor	L
5	S05	Operational control Line break	U50	Operational control defective	M50	Check operational control	L

Legend: W = Who should complete "Measure" E = End user L = Supplier

	Problem		Possible Cause		Measure		
Code	No.		No		No		W
No	Normal operation						
6	S06	Inside temperature	U60	Ambient temperature too high	M60	Check ambient temperature	L
			U14	CPU-circuit board defective	M14	Change CPU-circuit board	L
7	S07	Cooking platform Sensing element	U70	Sensing element Coil temperature Short circuit	M41	Check coil sensing element	L
8	S08						
9	S09						
10	S10	Communication error (Serial interface)	U100	Line break	M100	Check connection	L
			U101	Operational control defective	M101	Replace operation	L
			U14	CPU- circuit board defective	M14	Replace CPU-circuit board	L
11	S11						
12	S12						
13	S13						
14	S14						
15	S15						

Legend: W = Who should complete "Measure" E = End user L = Supplier

## Additional Errors

	Problem		Possible Cause		Measure		
Code	No.		No		No		W
No	Operation lamp is continuously "ON"						
	S20	Cooking platform does not heat enough	U10	Non induction type pan	M10	Compare on another cooking platform and with an induction type pan	E
			U200	1 phase is missing	M200	Check mains cable connection	L
			U12	Power board defective	M12	Replace power circuit board	L
			U14	CPU-circuit board defective	M14	Replace CPU-circuit board	L
	S21	Cooking platform continuously on maximum power	U50	Operational control defective	M50	Check operational control	L
			U14	CPU-circuit board defective	M14	Replace CPU-circuit board	L
			U12	Power circuit board defective	M12	Replace power circuit board	L
	S22	Empty cooking platform switches "on"	U220	Pan detection defective	M220	Check pan detection	L
	S23	Little metallic objects are heated on the cooking platform	U220	Pan detection defective	M220	Check pan detection	L
No.	Operation lamp flashes						
	S24	Cooking platform does not heat at all	U240	Pan too small (Diameter less than 12cm, 4.75")	M240	Use appropriate pan	E
			U200	1 phase is missing	M200	Check connection of mains cable	L
			U220	Pan detection defective	M220	Check pan detection	L
			U241	Short circuit on generator	M241	Replace or repair generator	L

Legend: W = Who should complete "Measure" E = End user L = Supplier

	Problem		Possible Cause		Measure		
Code	No.		No		No		W
No.	Operation lamp and error lamp "OFF"						
	S25	Unit does not heat, no reaction, contactor does not work	U250	Building's power fuses defective, error on electrical transmission	M201	Check mains supply	L
			U251	Error on operational control	M251	Check operational control	L
	S26	Building fuses blow when unit is switched on	U241	Short circuit in generator	M241	Repair or replace generator	L
	S27	Some cooking platforms do not heat	U271	Generator defective	M241	Repair or replace generator	L
	S28	Unit does not heat, no reaction, no contactor	U13	Error on DIP-Switch-adjustment on CPU	M13	Check DIP-Switch adjustment	L

Legend: W = Who should complete "Measure" E = End user L = Supplier

## Repair Of Problems

Measure	Activity	Comment
M10	<ul style="list-style-type: none"> <li>Compare on another cooking platform and with an induction type pan</li> </ul>	Check if the pan is appropriate to induction cooking or not: use a magnet.
M11	<ul style="list-style-type: none"> <li>Check connection of coil</li> <li>Check coil on line break</li> <li>Coil overheated (brown color change)</li> </ul>	
M12	<ul style="list-style-type: none"> <li>Change power circuit board</li> </ul>	
M13	<ul style="list-style-type: none"> <li>Check DIP-Switch adjustment on CPU-circuit board</li> </ul>	
M14	<ul style="list-style-type: none"> <li>Replace CPU-circuit board</li> </ul>	
M30	<ul style="list-style-type: none"> <li>Clear ventilation system</li> </ul>	
M31	<ul style="list-style-type: none"> <li>Clean fan</li> </ul>	
M32	<ul style="list-style-type: none"> <li>Connect fan directly at 230V</li> </ul>	
M33	<ul style="list-style-type: none"> <li>Change rectifier circuit board</li> </ul>	
M34	<ul style="list-style-type: none"> <li>Measure heat-sink temperature sensor resistor At 25° Celsius (77°F) resistor will read 20kOhm At 70° Celsius (158°F) resistor will read 3,5kOhm</li> <li>Check short circuit to case</li> <li>For a test: short-out the sensor with a 20kOhm fixed resistor</li> </ul>	Disconnect temperature sensor
M40	<ul style="list-style-type: none"> <li>Switch off unit, cool down and switch on again. Use a pan with cold water</li> </ul>	Switch off field!

Measure	Activity	Comment
M41	<ul style="list-style-type: none"> <li>Measure the resistance of coil temperature sensor resistor at 25° Celsius (77° F) resistor will read 1kOhm at 180° Celsius (356°F) resistor will read 3,5kOhm</li> <li>Resistor is higher on a higher temperature (PTC-resistor)</li> <li>Replace sensor with a value less than 900Ohm</li> <li>For a test: Short-out the sensor with a 1kOhm fixed RESISTER</li> </ul>	Disconnect sensing element
M50	<ul style="list-style-type: none"> <li>Measure operational control or main power control switch with potentiometer: Potentiometer is 10kOhm and linear</li> <li>On level "0": resistor = 0 Ohm</li> <li>On maximum level resistance= 10kOhm</li> <li>Resistor is proportional (linear) to swing angle</li> </ul>	Disconnect operational control (Poti)
M60	<ul style="list-style-type: none"> <li>Measure temperature inside the case</li> <li>Admissible ambient temperature: 0°C/32°F to appr. 70°C/158°F</li> <li>Check point is on the CPU-circuit board</li> </ul>	
M100	<ul style="list-style-type: none"> <li>Check connection cable for serial operational control and CPU-circuit board</li> </ul>	
M101	<ul style="list-style-type: none"> <li>Change serial operational control</li> </ul>	
M200	<ul style="list-style-type: none"> <li>Check mains cable, perhaps one phase missing</li> <li>Check the building fuses</li> </ul>	
M220	<ul style="list-style-type: none"> <li>Disconnect ST2 on CPU-circuit board and measure resistance between brown and blue, Measured value: 200Ohm &lt; R &lt; 2kOhm</li> <li>Replace rectifier circuit board</li> </ul>	
M240	<ul style="list-style-type: none"> <li>Use suitable pan material</li> <li>Test with a pan with a diameter of 24cm (4.75")</li> </ul>	
M241	<ul style="list-style-type: none"> <li>Disconnect mains power supply</li> <li>Visually inspect : blackened cables, components or strip conductors?</li> <li>Transistor module: measure internal diodes (UF = 0.4V)</li> <li>Rectifier: measure internal diodes (UF = 0.5V)</li> <li>Control trafo: measure electric voltage</li> <li>Check power supply CPU-print +24V</li> <li>CPU-circuit board ST1/1 and ST1/4 (24V +/- 1V)</li> </ul>	
M251	<ul style="list-style-type: none"> <li>Check power switch on operational control</li> </ul>	

## Adjustments

This induction unit has been correctly adjusted by the manufacturer. Any adjustments have to be made with caution. Please pay attention to the following points:

1. Note the original position of the poti's: remember the number of turns you make.

2. Errors can occur after wrong adjustments

3. Only small corrections can be made with adjustments

## Generator Type

The generator type is adjusted in the binary code with the DIP-switches 5 to 8 on the CPU-circuit board

### Switch Position

DIP-Switch for generator type	8	7	6	5
0				
1				ON
2			ON	
3			ON	ON
4		ON		
5		ON		ON
6		ON	ON	
7		ON	ON	ON
8	ON			
9	ON			ON
10	ON		ON	
11	ON		ON	ON
12	ON	ON		
13	ON	ON		ON
14	ON	ON	ON	
15	ON	ON	ON	ON

### Switch Power

#### Summary: software and generator type

The following list shows the number of types of the various generators.

Please note the positions of the power switches from the above table.

Type	DIP Switch setting
MO/DU 7000, 208V	6 and 8 on
MO/DU 7000, 400V	5 and 8 on

## Pan detection

The potentiometer on the rectifier circuit board is used to adjust the pan detection:

Turn clockwise: acceptance of smaller pans

Turn counterclockwise: only bigger pans are accepted

## Power

Only one potentiometer per field is available on the power circuit board to adjust the power:

Turn clockwise: less power

Turn counterclockwise: more power

## Repair by Garland

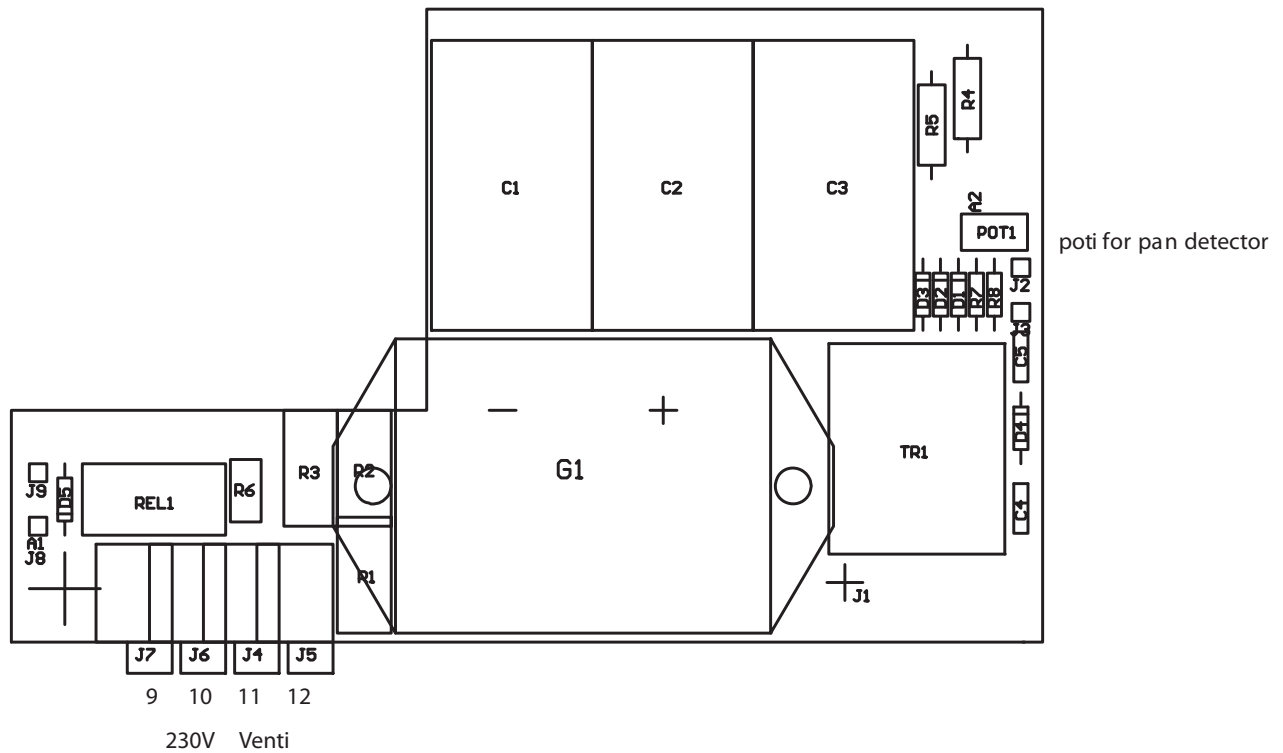
If the generator has to be repaired by the manufacturer, please enclose an exact description of the error. If possible, use the original package for the return. If it isn't available, do not use porous material for wrapping (like styropor). This could enter the unit and the electronic parts and is difficult to remove.

## SECTION 5 – APPENDIX

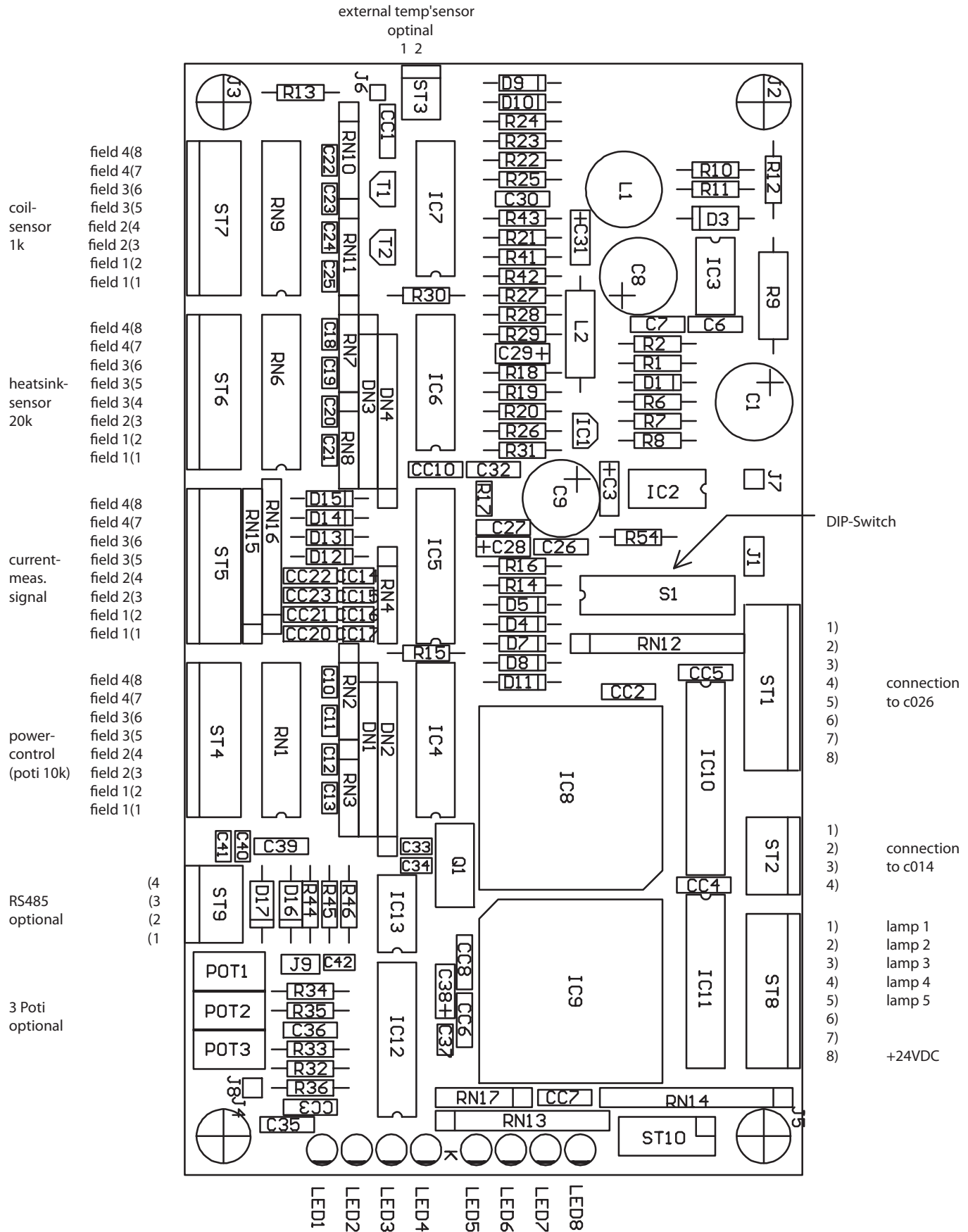
### Internal Connections

#### Rectifier Circuit Board C014

View solder side



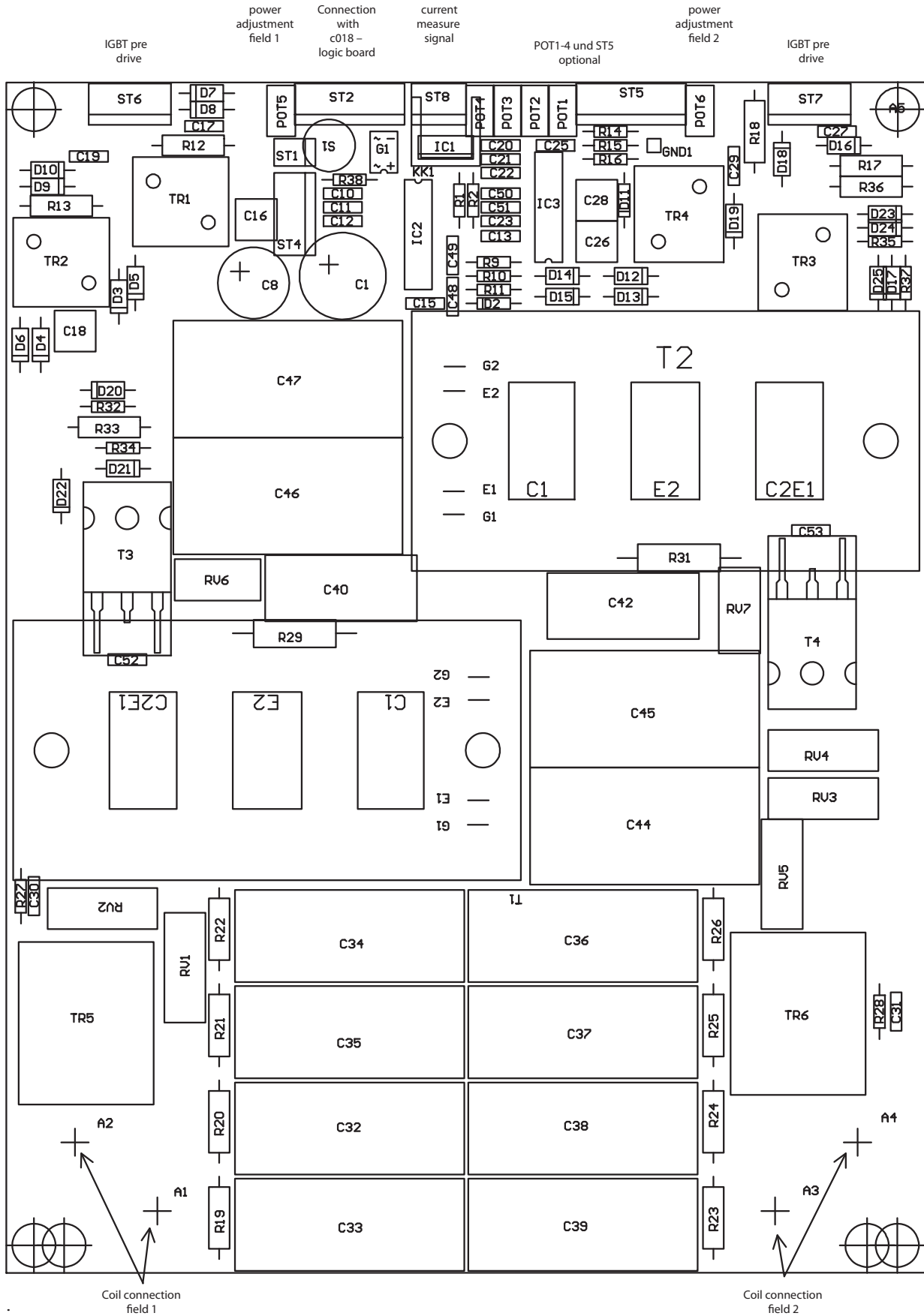
View components side



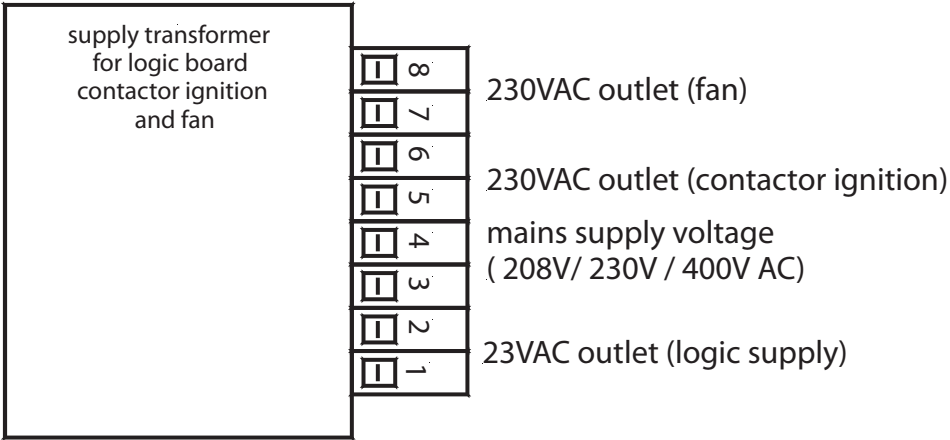


# Power Circuit Board C026

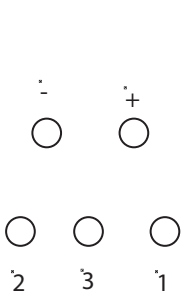
View components side



Transformer

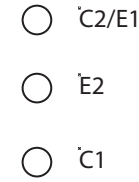
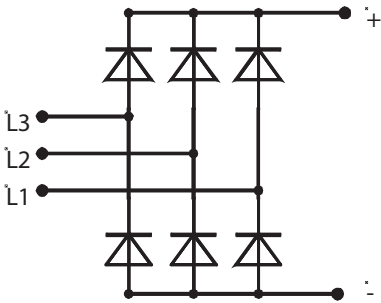


Rectifier And Transistor Module



solder side view  
rectifier board

Item . 1: rectifier



solder side view  
power board

Item 2: transistormodul IGBT

